Understanding mechanisms behind initiation of breast cancer

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Scope of the problem

- Cancer accounted for one in six deaths, in 2018.
- Breast cancer arises in the lining cells (epithelium) of the ducts (85%) or lobules (15%) in the glandular tissue of the breast.
- One in 28 women in india is likely to develop breast cancer during her lifetime.
- In 2020, there were 2.3 million women diagnosed with breast cancer and 685000 deaths globally.
- Existing therapies: Most therapies aim at killing the cancer cells (Chemo/Radio/Hypothermia)
- Cancer cells adapt and acquire multi-drug resistance

Aim

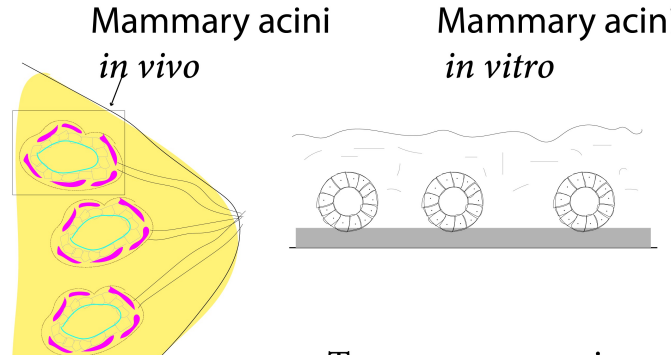
- Understanding how breast cancer initiates and generating novel therapies to fortify our body's defense mechanism against cancer

Objectives

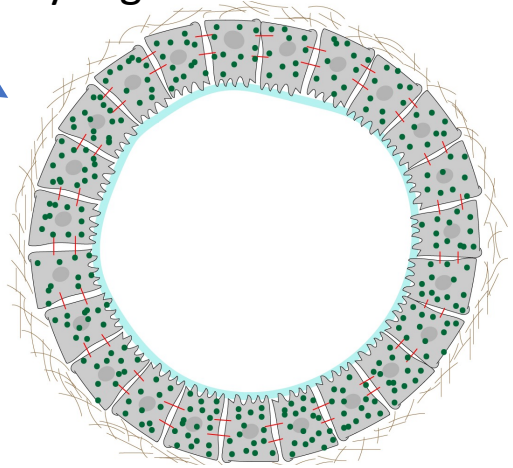
- Developing 3D breast organoids in the lab
- Transform healthy cells into oncogenic mutants
- Studying interactions between host cells and oncogenic cells- identifying mechanics behind initiation of cancer

Graphic work flow

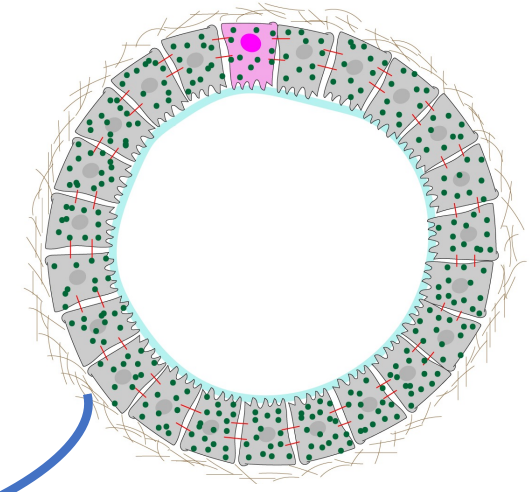
Studying initiation and progression of cancer in breast acini



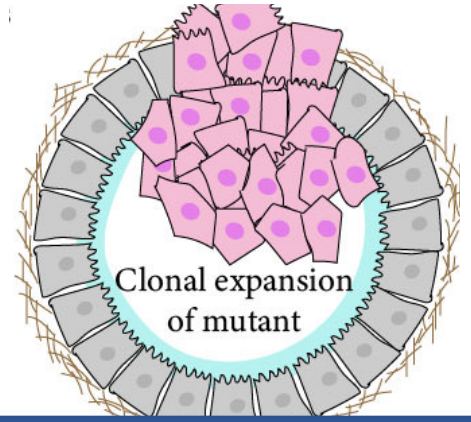
2D culture to
3D mammary organoids

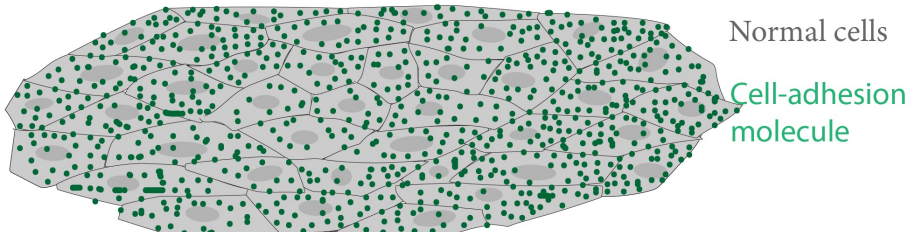


Introducing oncogenic mutant



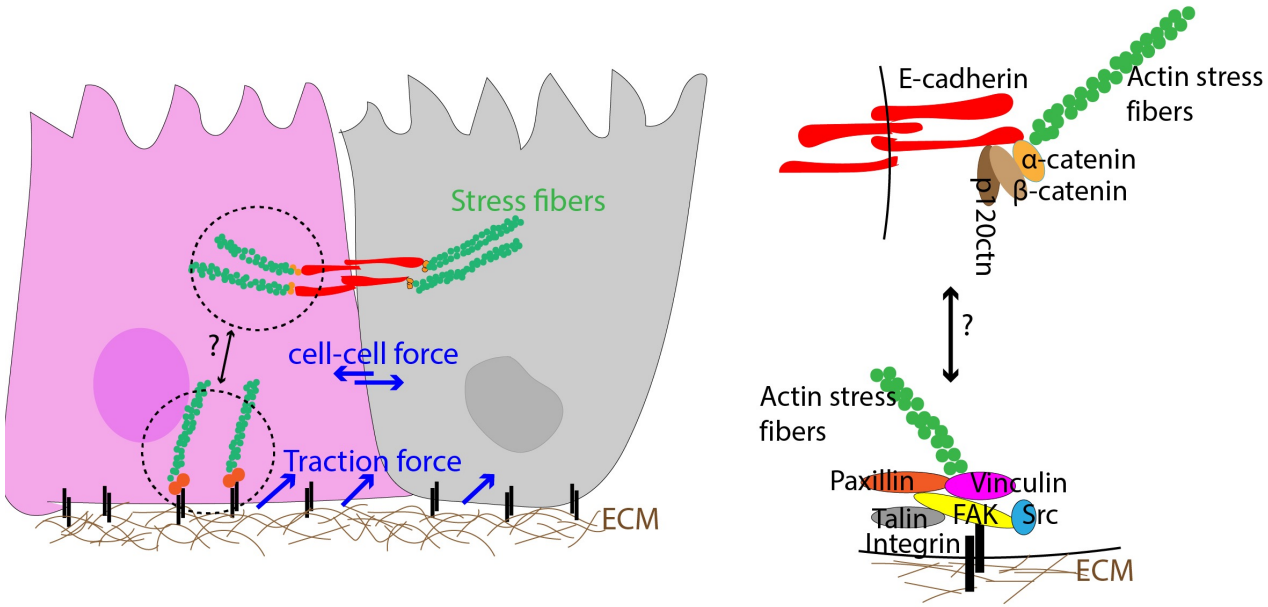
Clonal expansion of mutant





Genetic modification of mammary epithelial cells to tag cell adhesion molecules

Host cell-oncogenic cells interactions



Such an understanding will *reveal the pre-cancer stage* when tumour cells have not gained competitive advantage over host cells, and therefore can potentially be used to generate novel anticancer therapies harnessing the protective barrier of host epithelial cells against cancer[5]. This approach will complement the current approach to therapy, which focusses solely on apoptosis to kill the tumour cells

Further reading

Vishwakarma, M. & Piddini, E. Outcompeting cancer. *Nat Rev Cancer*, doi:10.1038/s41568-019-0231-8 (2020).

Parker et al; Cell Competition Spurs Selection of Aggressive Cancer Cells. *Trends in Cancer*, doi: 10.1016/j.trecan.2020.03.008 (2020)